GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[X] ORIGINAL [ ] REVISION NO. _____

Project No. G-42-622 R6006-1A0 GTRC/~~G42~~ DATE 8 / 8/ 86

Project Director: Dr. Christopher K. Hertzog School/~~Lab~~ Psychology

Sponsor: DHHS/PHS/NIH/NIA

Type Agreement: Grant No. 5 R01 AG06123-02

Award Period: From 8/1/86 To 1/31/87 (Performance) 4/30/87 (Reports)

Sponsor Amount:	This Change	Total to Date
Estimated:	$	$ 44,434
Funded:	$	$ 44,434

Cost Sharing Amount: $ N/A Cost Sharing No: N/A

Title: Aging and Cognitive Correlates of Intelligence

ADMINISTRATIVE DATA OCA Contact E. Faith Gleason X-4820

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Defense Priority Rating: N/A Military Security Classification: N/A

(or) Company/Industrial Proprietary: _____

RESTRICTIONS

See Attached NIH Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval – Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with GIT, however none proposed

COMMENTS:

Continuation of G-42-613

COPIES TO:

SPONSOR'S I. D. NO. 02.108.001.86.033

Project Director
Research Administrative Network
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GTRC
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Project File
Other A. Jones

FORM OCA 65:285

GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date 3-13-87

Project No. G-42-622 School/~~Lab~~XXX Psychology

Includes Subproject No.(s) N/A

Project Director(s) C.K. Hertzog GTRC /~~GIT~~XXX

Sponsor DHHS/PHS/NIH/NIA

Title Aging and Cognitive Correlates of Intelligence

Effective Completion Date: 1-31-87 (Performance) 4-30-87 (Reports)

Grant/Contract Closeout Actions Remaining:

- [ ] None
- [X] Final Invoice or Final Fiscal Report
- [ ] Closing Documents
- [ ] Final Report of Inventions
- [ ] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other

Continues Project No. G-42-613 Continued by Project No. G-42-627

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Other Ina Lashley
Angela DuBose
Russ Embry

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G-42-622

IV. Progress Report Summary

Publications

The following published papers, reprints, and unpublished manuscripts were written and/or published during the current period of support (Note: publications related to a second research grant, "Short-term change in memory and metamemory in the elderly," PHS Grant # 7-R01-AG06162-01, are not listed):

Hertzog, C., & Rovine, M. (1985). Repeated measures analyses in developmental research: Selected issues. Child Development, 56, 787-810.

Hertzog, C., & Schaie, K. W. (1986). Stability and change in adult intelligence: I. Analysis of longitudinal covariance structures. Psychology and Aging, 1, (in press).

Hertzog, C., & Nesselroade, J. R. (1986). Beyond autoregressive models: Some implications of the trait-state distinction for the structural modeling of developmental change. Manuscript submitted for a special section of Child Development on structural equation modeling.

Hertzog, C., Raskind, C. L., & Cannon, C. J. (1986). Age-related slowing in semantic information processing speed: An individual differences analysis. Journal of Gerontology (in press).

Hertzog, C., Raskind, C. L., & Cannon, C. J. (1986). Age differences in semantic information processing speed. Unpublished Manuscript.

Schaie, K. W., & Hertzog, C. (1986). Toward a comprehensive model of adult intellectual development: Contributions of the Seattle Longitudinal Study. In R. J. Sternberg (Ed.), Advances in the Psychology of Human Intelligence (Volume 3). Hillsdale, NJ: Lawrence Erlbaum Associates.

Copies of selected articles and manuscripts are provided in Appendix A.

Report

1. Scientific Goals

The basic goals of this work have not changed. Briefly, they involve identification of the relationship between information processing speed and psychometric intelligence, in order to determine whether (1) individual differences in psychometric intelligence in adult populations are correlated with the speed of executing simple, basic cognitive processes; (2) age differences in a "speeded" set of psychometric measures covary with

age differences in information processing speed; and (3) hypotheses derived from individual differences models of age changes in cognitive information processing speed are reflected in confirmatory factor analyses of psychometric and RT tasks.

2. Summary of Results

In the current budget year, we have completed the following work: 1) completed write-up of manuscripts describing pilot studies validating the basic verbal and spatial information processing speed tasks in the target population; 2) entered, cleaned, and analyzed cross-sectional data on psychometric intelligence, emphasizing the assessment of primary abilities of theoretical importance in evaluating the intellectual speed hypothesis; and 3) completed the data collection on the microcomputer tasks for substantial undergraduate student and adult alumni samples. We are currently analyzing the data from parts 2 and 3 and are 4) running a second phase of data collection on the microcomputer tasks.

Pilot Study: Semantic Information Processing Speed. The first pilot study was designed to examine the microcomputer-controlled RT tasks to be used to measure basic information processing speed (simple RT and two-choice RT to nonverbal stimuli) and semantic information processing speed (a semantic verification task, a semantic matching task, and a synonym matching task). The semantic verification task required a same/different discrimination of category-instance stimulus pairs (e.g., FRUIT - APPLE [same]; FRUIT - TROUT [different]). The semantic matching task measured instance-instance matches (e.g., APPLE - PEAR). The synonym matching task required subjects to judge whether two high frequency nouns had the same meaning (e.g., COOK - CHEF). We hypothesized that all three tasks were measuring a common individual differences dimension termed "semantic memory access speed," making them suitable as multiple measures of this dimension in latent variable models. Thus, we expected similar mean age differences on the tasks. We also hypothesized that the latent variable, SMA, would have similar properties in both young and old groups. Finally, we were interested in determining whether the correlations of the SMA factor with the simple RT and two-choice RT tasks would be higher in th e old group, as compared to the young group. A higher correlation would be predicted by the hypothesis of a common cause of slowing in information processing speed. The basic hypotheses were confirmed. First, age differences on the semantic tasks were quite similar. Second, the three semantic measures formed an SMA factor that was differentiated from the two-choice and simple RT factors. Third, this factor had equivalent factor loadings in both age groups. Fourth, we found that the correlations among the three RT factors differed between the age groups. The two-choice factor and the SMA factor correlated more highly in the old, whereas the simple RT factor was less correlated with both choice-RT factors in the old.

Cross-sectional study of psychometric intelligence. The second part

of the study consisted of an administration of a large battery of psychometric tests to a cross-sectional sample of adults and undergraduate students. The battery was designed to measure multiple indicators of a) the primary ability factors assessed in Thurstone's PMA (Verbal Comprehension, Spatial Relations, Induction, and Numerical Facility), b) additional visuo-spatial abilities (Spatial Visualization, Flexibility of Closure), and c) highly speeded abilities, including (Psychomotor Speed and Perceptual Speed). The cross-sectional sample contained alumni of the Pennsylvania State University, age ranges 43-75, additional volunteers in the age range 43-90, drawn from the general Harrisburg community (Total adult N = 622), and a comparison group of undergraduate Penn State students (N = 211). We found the "classic" cross-sectional pattern of mean differences observed in the literature is found in these data; namely, little or no cross-sectional differences on tests of Verbal Comprehension and Numerical Facility, but significant cross-sectional differences on measures of Induction, Spatial Relations, and Perceptual Speed. These data also show significant cross-sectional differences on Spatial Visualization and Flexibility of Closure. Large sex differences, favoring men, were found on the spatial and numerical factors, as predicted from the literature.

One of the key predictions for the cross-sectional data was that the correlations of speeded abilities, especially the tests measuring the ability to mark correct answers on the PMA answer sheets, would correlate more highly with other test scores in the middle-aged and older adults than in the undergraduate students. In general, the correlations among the tests are higher in the adult sample, particularly for highly speeded subtests. The answer sheet speed tests appear to form a common factor that is more highly correlated with PMA performance in the old, as predicted. Preliminary results from the confirmatory factor analysis we are now conducting suggest that the correlation of Induction and Spatial Visualization is in the .7 to .8 range in the adult population. It also suggests that substantial components of variance in the Thurstone PMA tests of Verbal Meaning and Reasoning are determined by ability-extraneous speed factors.

The first microcomputer study. We recently completed testing of just over 150 individuals in a microcomputer task battery measuring simple RT, two-choice RT, semantic RT (the set of microcomputer tasks used in the pilot study), and the mental rotations task. Two separate blocks of synonym matching were given to provide additional data on this task, so that it can be related to recognition vocabulary test performance. 77 adults, ages 43 - 70, and 75 undergraduate students (from both Penn State and Georgia Tech) participated in the study. All these individuals had previously been tested on the full psychometric battery. Analysis of the microcomputer task data is in progress, and should be completed by the end of the second year of the grant.

The second microcomputer study. Data from a second sample of 125 adults from the Harrisburg study are now being collected, and will be completed by the end of July. The study differs in small but potentially important ways from the first study just completed. First, we have added an additional two-choice RT task. This task requires a Same/Different judgment on the direction of two arrows (as opposed to the other task, that requires a judgment of the direction of a single arrow). This task probably provides a better control task for the semantic and spatial RT tasks, as the type of judgement (a two-figure match) is identical. Preliminary results suggest this judgement requires about 200 msec more, on average, than the two-choice RT task on the direction of a single arrow. The important question is whether individual differences on this task relate more closely to the semantic RT tasks than did the other two-choice task, and if so, if the semantic RT factor can still be differentiated from the nonverbal two-choice task. Second, we are exploring the effects of accuracy and RT speed feedback on the individual differences results. In the first study, subjects were given trial by trial feedback on accuracy, but not RT. This is a relatively standard experimental procedure that maintains acceptably low error rates in student samples! However, we have observed some exceptionally slow response times in adults who appear to be conservative in their criterion for trading speed for accuracy. That is, they seem too willing to slow their response times in order to maximize accuracy. This opens the possibility that the distributions of RT parameters will be unduly influenced by individual differences in speed-accuracy criteria. To get some indication of this, we have adopted a different practice and experimental feedback strategy. During practice, subjects receive at least two blocks of practice trials. In the first, they receive trial by trial accuracy feedback to shape their responses. At the end of the first practice block, they receive feedback on both speed and accuracy. In the subsequent practice blocks, they receive only summed feedback on both speed and accuracy at the end of the block. No feedback is given during the experiment (only a neutral "thank you"). During the feedback at the end of practice blocks, experimenters emphasize both speed and accuracy. They reinforce verbally reductions in RTs from the first to the second practice block. The question is whether similar age differences in RT and in RT/psychometric test relationships will be observed under these somewhat different experimental procedures.

3. Objectives for Current Year

The objectives for the final 6 months of the project are a) to complete analysis of the microcomputer task data, converting RT trial data into summary parameters that describe individual performance on the tasks; b) exploration of microcomputer task/psychometric intelligence relationships, using LISREL models to test predictions of convergent/discriminant validity of verbal and spatial information processing speed/ability relationships. We will have adequate sample sizes to test the invariance of the prediction equations over the two age samples

(student vs. alumni) in both studies, with the prediction that there will be higher information processing speed/intelligence relationships in the adult samples; c) completion of manuscripts describing the (1) cross-sectional intelligence data, (2) the factor structure of the psychometric battery, and its invariance across age, (3) the information processing speed tasks, and (4) the information processing/intelligence test relationships. We are also planning on presenting results from the psychometric study at the Gerontological Society meetings in Chicago.

4. Human Subjects

No additional data on human subjects will be collected in this phase of the project. Protocols to protect the confidentiality of data in our computer data base, as described before, will be observed.